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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

BOUTSIKARIS, LEONIDAS

ART UNIT PAPER NUMBER

2872

DATE MAILED: 12/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/029,399

Applicant(s)

BATCHKO, ROBERT G.

Examiner

Leo Boutsikaris

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 September 2006.
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 29-53 and 147-176 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 29-53 and 147-174 is/are rejected.
7) ☒ Claim(s) 175 and 176 is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 19 October 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 29-36, 38-40, 43-53, 147-149, 151-157, 159, 161-174 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimoto (GB 2171535).

Regarding claims 29, 34, Nishimoto discloses an optical processor (Fig. 5) comprising an optical module, wherein the optical module includes n addressable optical elements 2_2-2_n , where $n > 2$, the optical elements being positioned in series. Each addressable optical element may be in one of two states (depending on the position of switches 5_2-5_n), the optical processor providing 2^n addressable filter functions, wherein the n addressable optical elements are stacked in series such that light forming an image sequentially passes through all n addressable optical elements for all 2^n addressable filter functions, wherein each of said filter functions produces a unique transform between an object and an image, whereby there are 2^n unique transforms (since there are 2^n discrete focal points $F_1, F_2 \dots F_N$), see lines 110-127, p. 2.

However, Nishimoto does not teach that the focal points $F_1, F_2 \dots F_N$ are equidistant from each other. Nishimoto does teach that selective turning on of the n switches allows for the selective choice of the focal point, and in addition, fine tuning around the focal points is possible

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by using the variable voltage source 7 (see lines 120-127, p. 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the focal pints along the focal length range equidistant, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235. Linear increase in the focal power of a device utilizing the system of Nishimoto, for example a digital lens, allows for easier implementation, since the settings for the controllably variable switchable elements are similar.

Regarding claims 30-31, all the transforms are related since they comprise various focal imaging lengths of corresponding thin lenses stacked in series.

Regarding claim 32, each of the 2^n transforms images the input object at a different output/image plane, where there are 2^n such planes (lines 120-122, p. 2).

Regarding claim 33, each of the 2^n addressable output plane locations lies along the same optical axis as the input plane (see Fig. 5).

Regarding claim 35, there are 2^n addressable magnifications (since there are n different lenses), see lines 113-114, p. 2.

Regarding claim 36, each of the 2^n transforms images the object at a different deflection angle (see Fig. 5).

Regarding claim 38, the optical elements can be randomly addressed to the extent that they respond to received inputs, which may be random.

Regarding claim 39, each of the n addressable optical elements is characterized by two states.

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Regarding claim 40, each of the two states is characterized by a different value for an optical property (e.g., polarization state of output light) of the given addressable optical element.

Regarding claim 43, change in the polarization state of the output light corresponds to change in the focal length of the corresponding birefringent lens.

Regarding claims 44-45, each of the optical lenses is a thin lens because of the small axial size, thus producing a composite focal length given by the equation of claim 44 (for illustration purposes only, see equation 5.39 in Hecht).

Regarding claim 46, the unique transform is an image distance transform.

Regarding claims 47-53, the focal length of the module is determined by the status of each lens/polarization plane rotating element, which in turn is determined by the value of a control signal in the form of an applied voltage, which is typically digital, comprising a plurality of bits, which correspond to the various values of the composite focal length of the module. Each digital input voltage signal results in a corresponding analog output optical signal (e.g., an image).

Regarding claims 147-148, the variable focal length device of Fig. 5 includes a nonlinear optical medium 6 whose state is varied and contributes to the output position of the image.

Regarding claim 149, the optical module includes an optical medium having n subsections that define the addressable optical elements (in the same sense as in Fig. 2A of the present specification).

Regarding claims 151, 153, 159, 161, the nonlinear optical medium 6 may be KH_2PO_4 (line 51, p. 2).

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Regarding claim 152, the means for altering the optical properties of the addressable elements include contact pads and a voltage source coupled to the pads (see Fig. 5).

Regarding claims 154-155, the device of Fig. 5 can be considered as having a first and a second optical module, each module performing a lens operation along an axis.

Regarding claims 156-157, the optical medium KH_2PO_4 exhibits second order nonlinearities.

Regarding claims 162-165 the optical medium may be a liquid crystal lens element 6, which has two or more states of its refractive index depending on the applied voltage via contact pads (lines 23-25, 34-37, p. 2).

Regarding claims 166-167, there is glass or plastic in the form of lenses 3 proximate to the contact pads of each optical medium 2.

Regarding claims 168-169, there is liquid crystal material dispersed within the electro-optic medium, constituting lens element 6.

Regarding claims 170-171, the dispersed liquid crystal is birefringent, which implies that the material has an ordinary and extraordinary axis (lines 99-103, p. 2)

Regarding claim 172, the system of Fig. 5 includes polarization rotators 2_2-2_n (lines 111-112, p. 2).

Regarding claim 173, the polarization rotators are electro-optic half-wave plates (line 59-62, p.1).

Regarding claim 174, the device further includes a polarizer 1 (line 53, p. 1).

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Claims 37, 41-42, 158 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimoto (GB 2171535) in view of Popovich (US 6,356,366).

Regarding claims 37, 41-42, Nishimoto discloses all the limitations of said claims except for showing that each addressable optical element is a switchable holographic optical element, especially in the form of a holographic lens comprising a liquid crystal structure. Popovich discloses an optical processor (Fig. 1) comprising an optical module 10, wherein the optical module 10 includes a plurality of addressable optical elements 26, 28, 30, wherein the addressable optical elements are positioned in series (lines 32-65, col. 2). Furthermore, each holographic optical element is a holographic lens in the form of fringes incorporated within a liquid crystal structure (lines 38-49, col. 3, 8-14, col. 4). It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the combination lens/polarization plane rotating element of Nishimoto with a switchable holographic lens of Popovich, since the latter comprises a single element as opposed to the combination of two elements of the former, and it smaller, easier to make and offers more flexibility in choosing the various values of the varied optical property, e.g., the focal distance.

Regarding claim 158, the holographic element of Popovich has third order nonlinearity, being of holographic nature.

Claims 150, 160 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishimoto (GB 2171535) in view of Popovich (US 6,356,366) and further in view of Waldern (US 6,407,724).

Nishimoto in view of Popovich discloses all the limitations of said claims except for teaching that the switchable holographic elements may be optically addressed. Waldern discloses switchable holographic optical elements, which may be selectively acted upon by using optical addressing (lines 16-24, col. 14). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use optical addressing to affect changes on the holographic elements of the optical processor of Nishimoto in view of Popovich, since optical addressing offers a much higher connection speed than accessing via electrical wiring.

Response to Applicant's Arguments

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Allowable Subject Matter

Claims 175-176 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 175-176 are allowable over the prior art of record for at least the reason that even though the prior art discloses a combinatorial optical processor comprising a multitude of switchable elements, the prior art fails to teach or reasonably suggest a combinatorial optical processor having a plurality of selectable focal powers, wherein the N addressable elements have the claimed focal lengths in each switched state, as set forth by the claimed combination.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Leo Boutsikaris whose telephone number is 571-272-2308. The examiner can normally be reached on M-F, 10-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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November 27, 2006



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